Proton Source Shutdown Work Summary

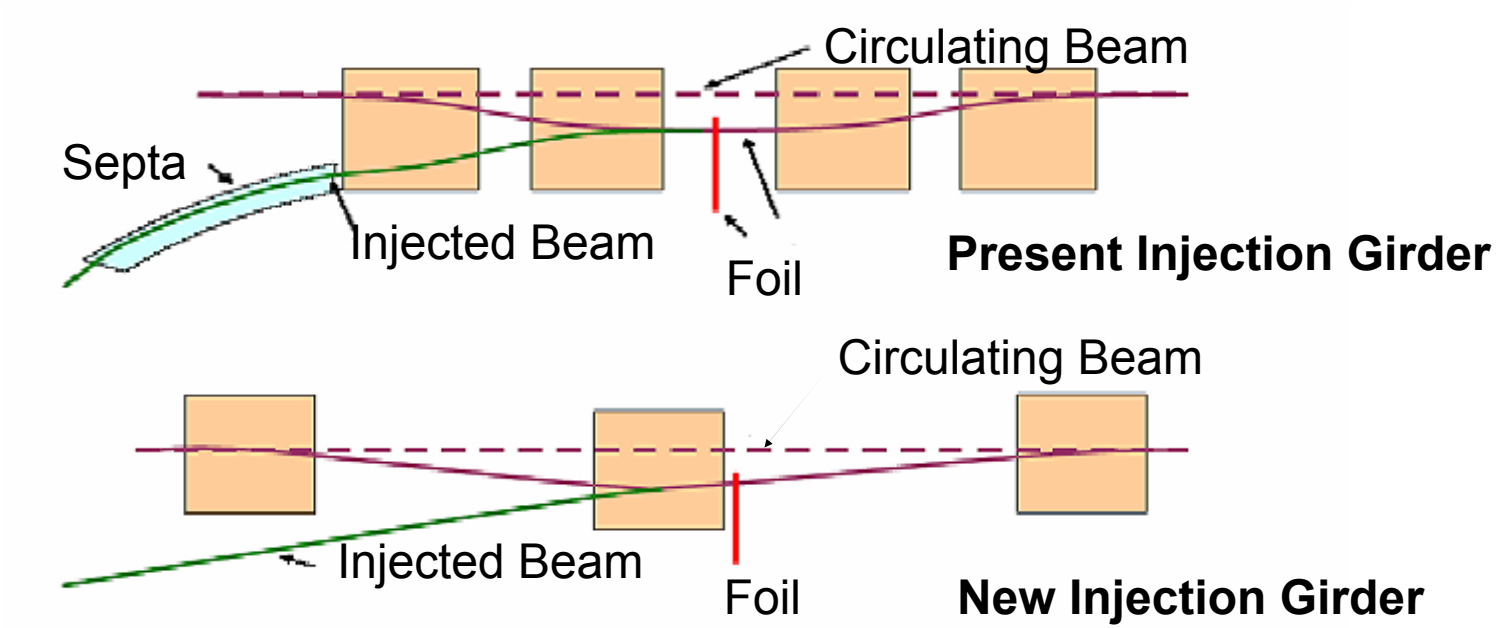
- Major:
  - ORBUMP/400 MeV
    - Install new ORBUMP magnets and power supply
    - Rearrange injection girder and 400 MeV line
  - Dump relocation
    - Move Booster dump, which is currently at Long 13, to the MI-8 line
    - Rework interlocks to allow to run there with MI in access
    - Use for test pulses and short batching
- Significant:
  - Install new water manifolding in Booster
    - Preparation for new corrector system in 2007 and 2008
  - 400 MeV line power supplies
    - Replace unreliable "Power 10" supplies with superior Lambda supplies
    - Replace a number of badly spec'ed supplies with more appropriate ones.

Shutdown Work Summary (cont'd)

- Minor:
  - Prep chopper area for MTA beam line
    - Move quad
    - Install some new vacuum hardware
  - Install beam stop in 750 keV line
    - Will allow ion source to run with Linac in access
  - New collimator in tank 1
    - Replace existing manual collimator with motorized one with more granularity in the aperture size.

ORBMP/Injection Modification

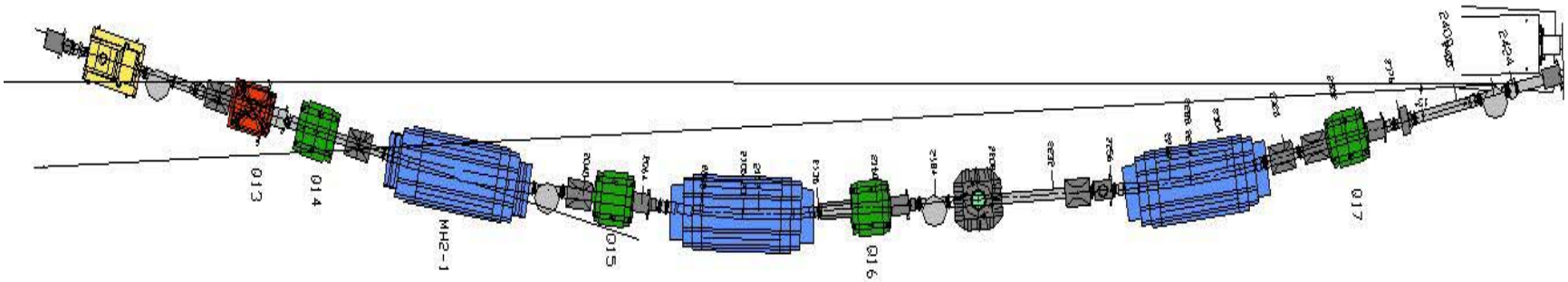
- New Booster Injection - ORBMP Girder & PS
  - A simplified 3 Bump injection scheme
    - Septa Magnet not required
    - Better Lattice Match
    - Alignment of Circulating beam with Injected beam
  - New ORBMP ps and magnets that can run at 15 Hz
    - Present system limited to 7.5 Hz due to heating



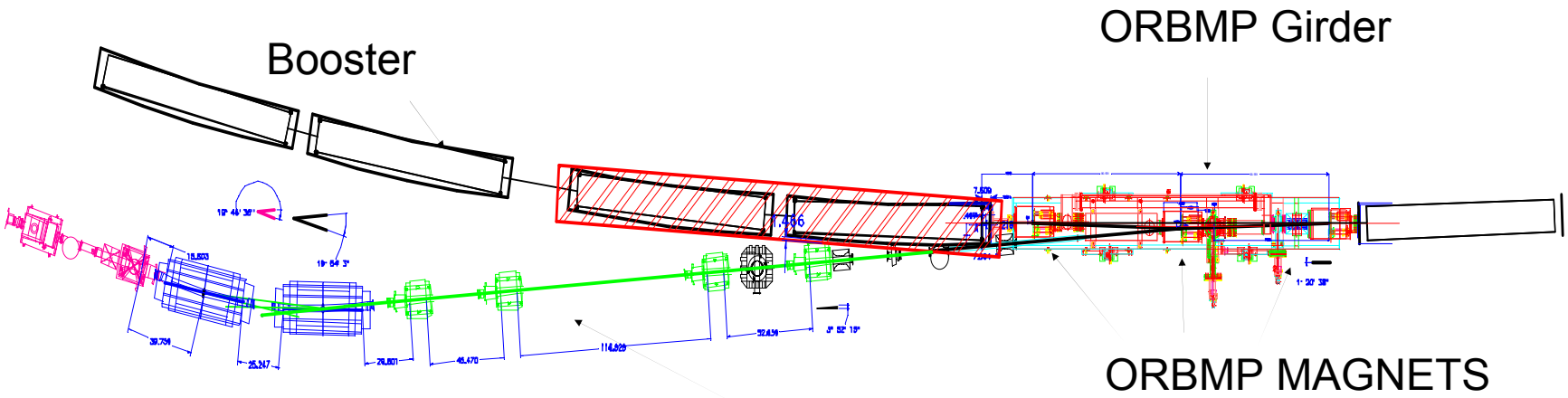
Provided by Jim Lackey and Fernanda Garcia

400 MeV Line Modifications

Current Scheme



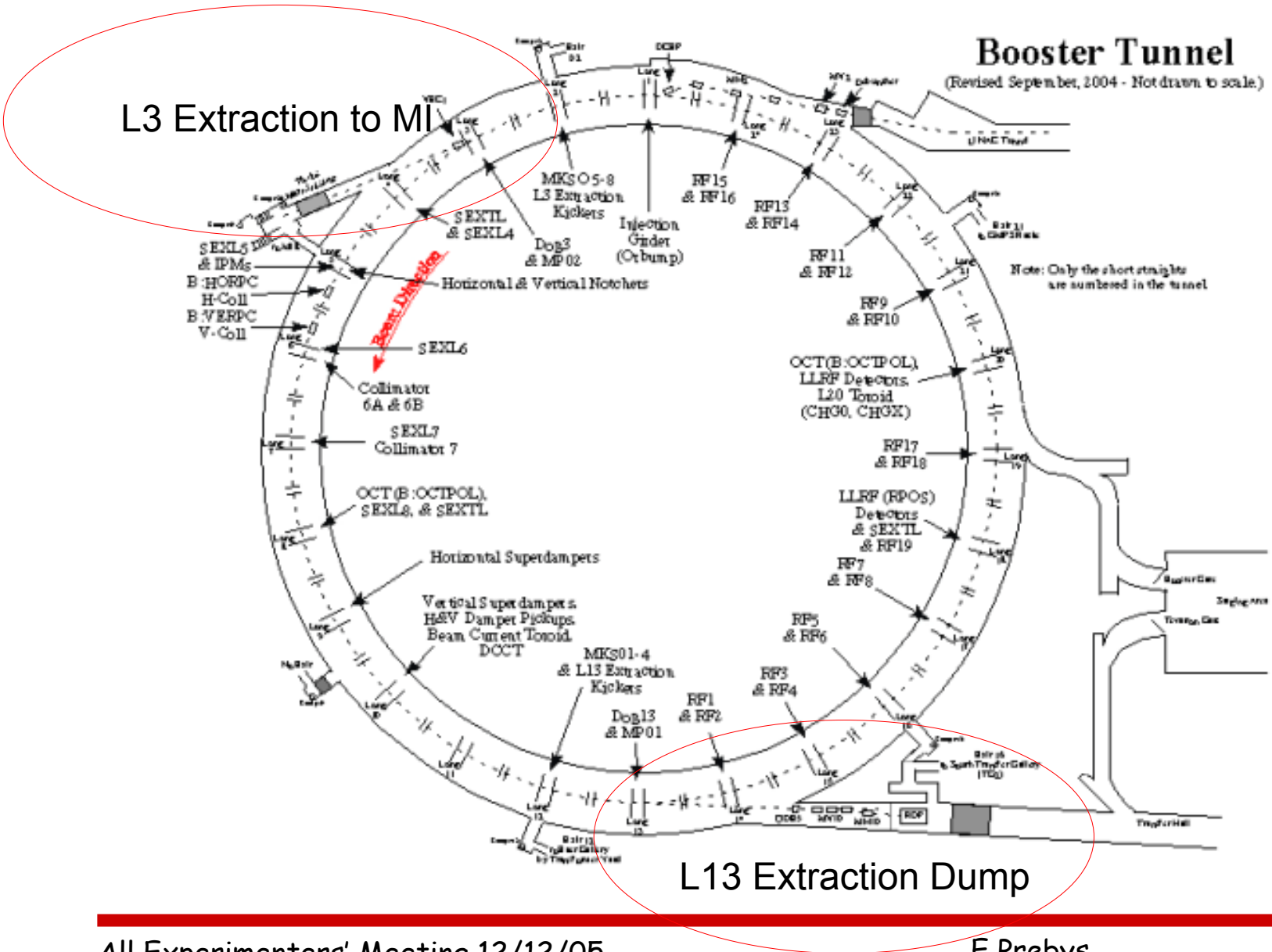
New Scheme



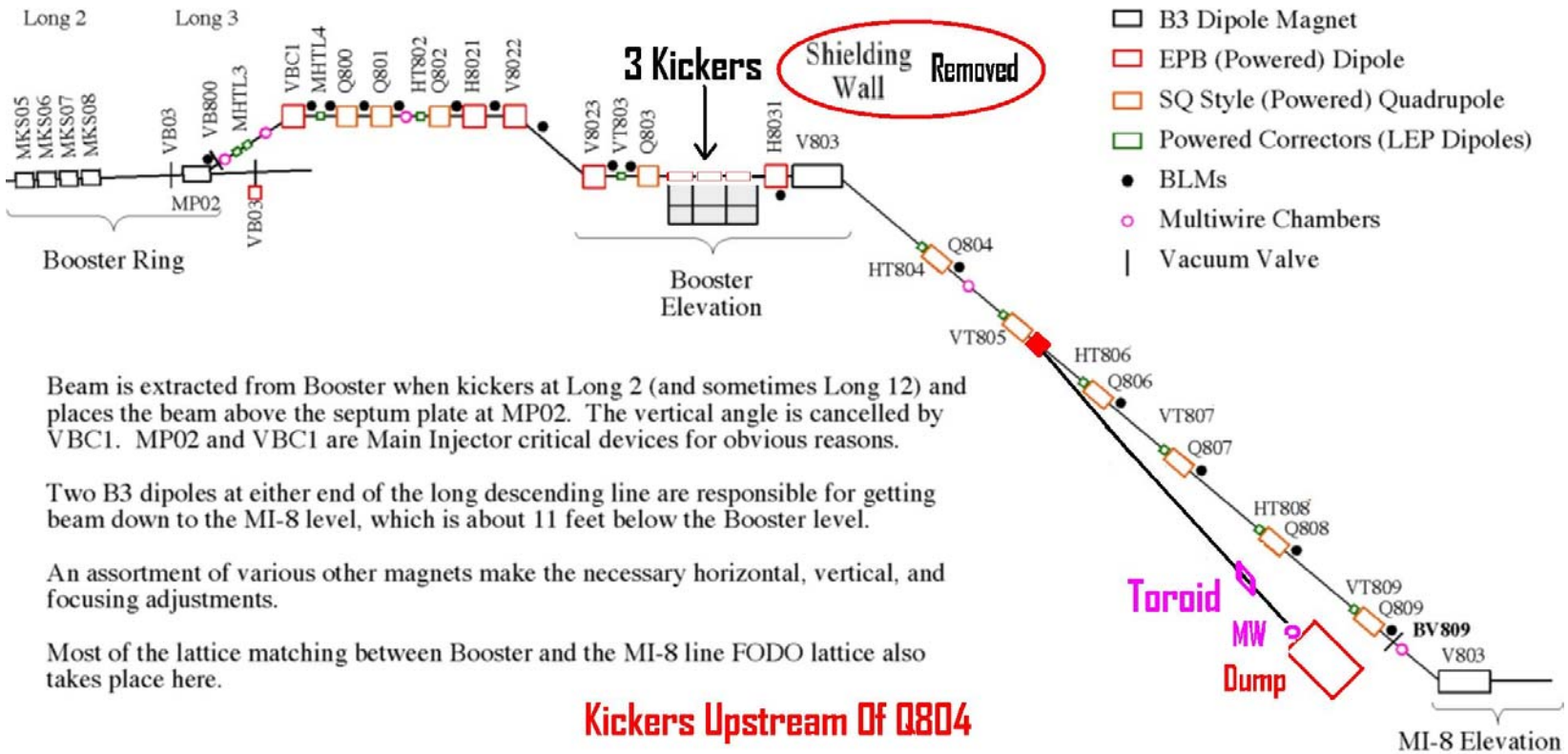
New 400 MeV Injection Layout

Provided by Jim Lackey and Fernanda Garcia

Booster Tunnel Overview



Booster Dump Relocation



Beam is extracted from Booster when kickers at Long 2 (and sometimes Long 12) and places the beam above the septum plate at MP02. The vertical angle is cancelled by VBC1. MP02 and VBC1 are Main Injector critical devices for obvious reasons.

Two B3 dipoles at either end of the long descending line are responsible for getting beam down to the MI-8 level, which is about 11 feet below the Booster level.

An assortment of various other magnets make the necessary horizontal, vertical, and focusing adjustments.

Most of the lattice matching between Booster and the MI-8 line FODO lattice also takes place here.

Kickers Upstream Of Q804

Vertical Profile of Upstream of MI-8 Line

Additional Booster Work

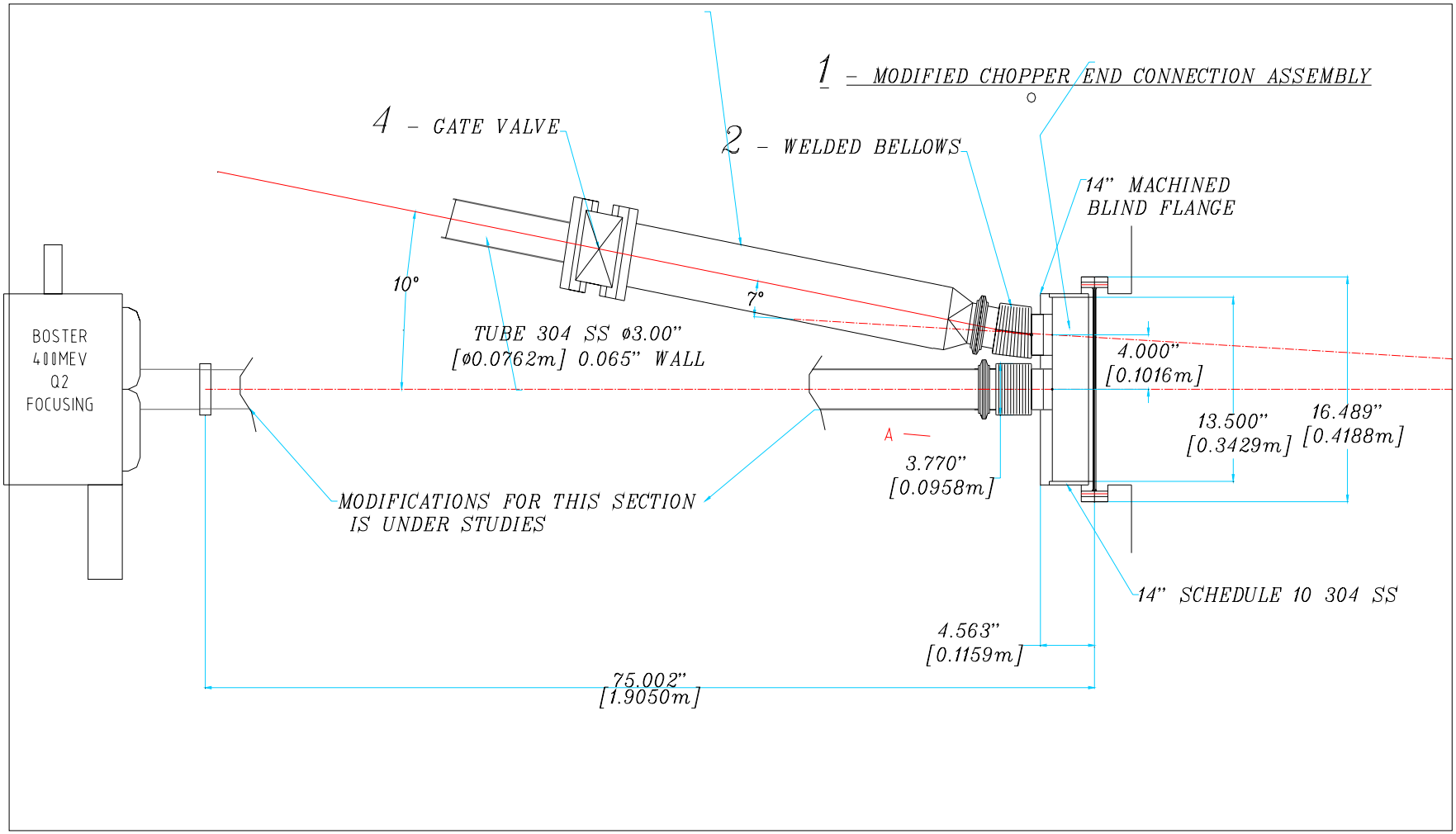
- Install water manifold connections at 48 sub-periods in preparation for corrector upgrades in 2007 and 2008 shutdowns.
  - Est. ~300 hours over 37 days
- Upgrade DC power supplies for 400 MeV line
  - Total of 31 DC supplies replaced in 400 MeV line
  - For the most part, this uses different people than all the other work.

Q74 Move

BLD – will be removed to make space for quad

Quad to be moved 10” upstream

- Move Q74 10” upstream to make room for bending C magnet to be used for MuCool/diagnostic beam extraction
- Install Y pipe at downstream end of chopper
- Est. 2 days


1 – MODIFIED CHOPPER END CONNECTION ASSEMBLY
4 – GATE VALVE
2 – WELDED BELLOWS
14" MACHINED BLIND FLANGE
BOSTER 400MEV Q2 FOCUSING
10°
7°
TUBE 304 SS ø3.00" [ø0.0762m] 0.065" WALL
4.000" [0.1016m]
13.500" [0.3429m]
16.489" [0.4188m]
A
3.770" [0.0958m]
MODIFICATIONS FOR THIS SECTION IS UNDER STUDIES
14" SCHEDULE 10 304 SS
4.563" [0.1159m]
75.002" [1.9050m]

Other Linac Projects

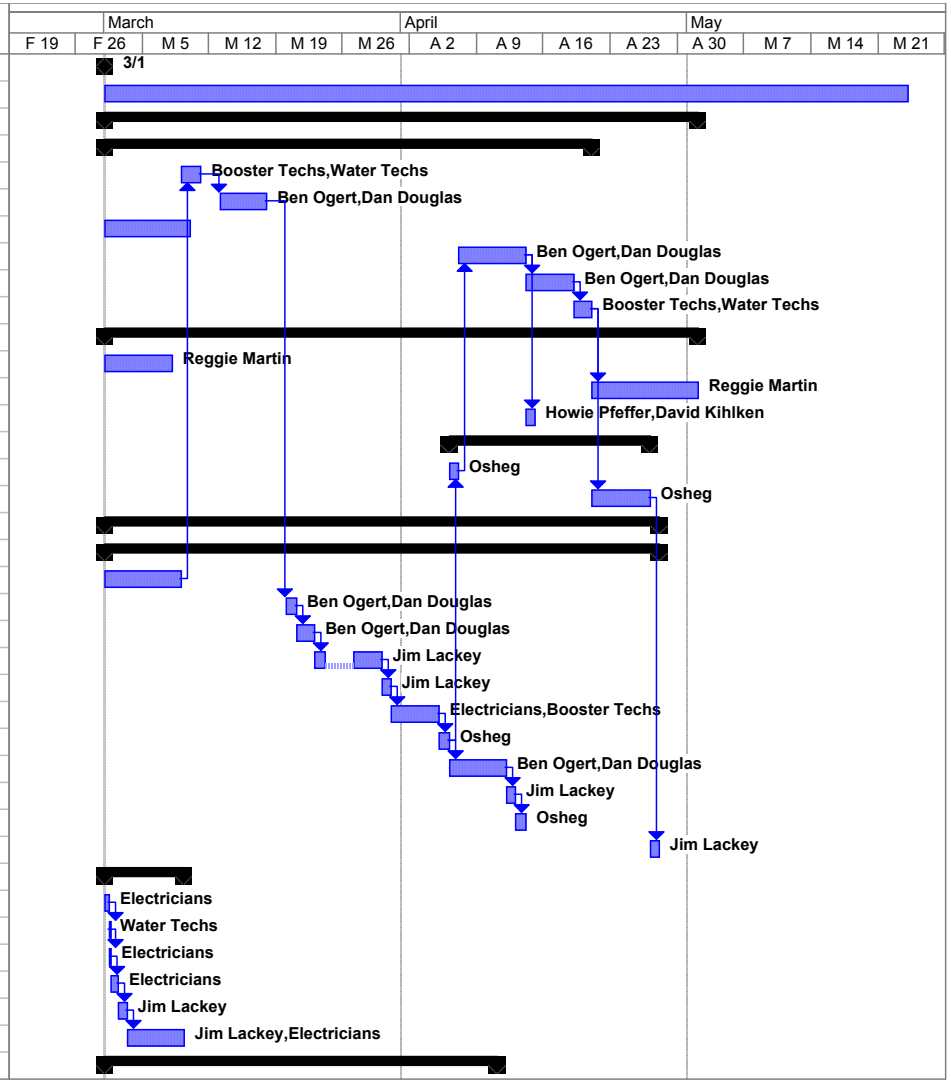
- 750 keV line beam stop
  - To allow ion source to run with Linac in access
  - Est. 1 day
- Tank 1 collimator upgrade
  - Motorize collimator
  - Replace collimator wand with one that has finer gradation of hole sizes.
  - Est. 2 days

Organization

- Rich Andrews
  - Shutdown Coordinator
  - Booster alignment liaison
- Fernanda Garcia
  - Coordinate 400 MeV Line/ ORBUMP work
- Bill Pellico
  - Coordinate Dump Relocation project
- Craig Drennan
  - Oversee water manifold work
- Reggie Martin
  - 400 MeV line power supply upgrade
- All mechanical work coordinated with Dave Augustine and mechanical support

Planning Detail (example)

ID	Task Name
1	BOOSTER UPGRADES
2	SHUTDOWN DURATION
3	**400MeV Line Reconfiguration**
4	**Installation**
5	Vent vacuum/disconnect electrical/LCW
6	Remove 400MeV magnets & other components
7	Reroute power supply cables
8	Install 400MeV magnets and other components
9	Connect vacuum system/pump down/leak check
10	Connect water/electrical
11	**Upstairs (Booster West Gallery)**
12	400 MeV Power Supplies Installation
13	400 MeV Power Supply Testing
14	400 MeVMH2 PS change gain
15	**Alignment**
16	400 MeV stake survey
17	400 MeV survey
18	**OrBump System**
19	**OrBump Magnets**
20	Cooldown Period
21	Remove DC Septum
22	OrBump girder removal
23	Remove old corrector package
24	Remove old Orbump cables/prep work & clean up
25	Pull cables/terminate/head
26	OrBump girder stake survey
27	OrBump girder installation
28	OrBump miscellaneous instrumentation installation
29	OrBump girder survey
30	Install injection foil
31	**OrBump Power Supply (Booster West Gallery)**
32	Disconnect power & controls
33	Disconnect water
34	Remove OrBump transformer
35	480 V change out
36	Disassembly/move to storage
37	Install & connect
38	**Dump Relocation**



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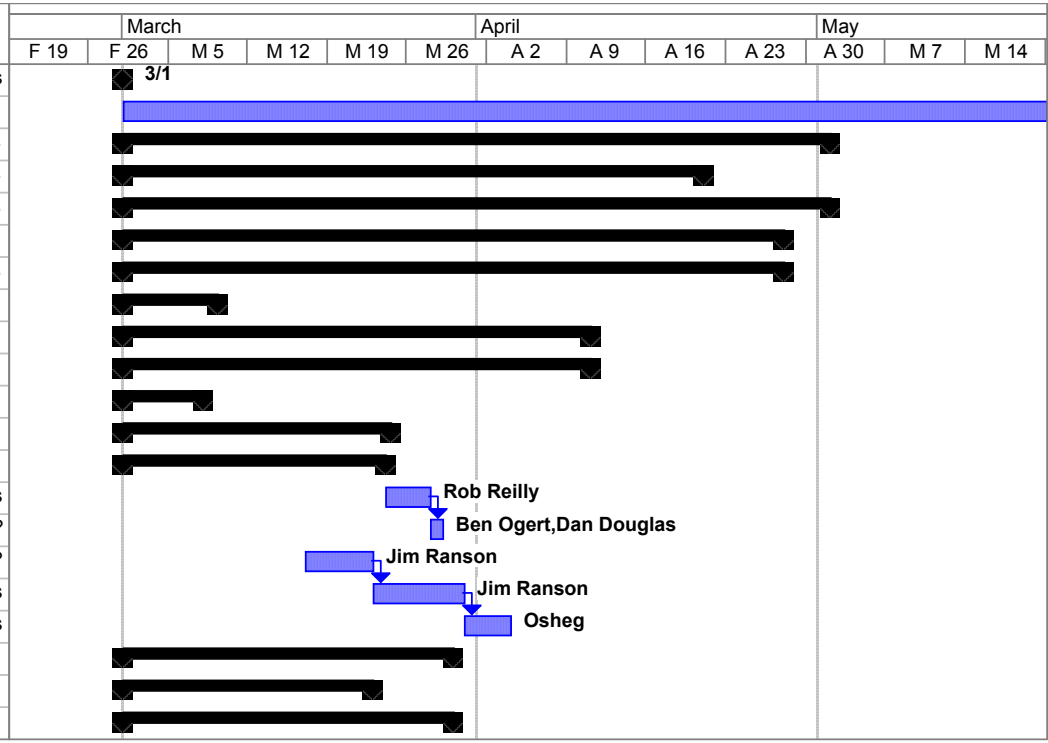
Overall Timetable

ID	Task Name	Duration
1	BOOSTER UPGRADES	0 days
2	SHUTDOWN DURATION	12 wks
3	**400MeV Line Reconfiguration**	**44 days**
4	**Installation**	**37 days**
11	**Upstairs (Booster West Gallery)**	**44 days**
18	**OrBump System**	**42 days?**
19	**OrBump Magnets**	**42 days**
31	**OrBump Power Supply (Booster West Gallery)**	**6.01 days?**
38	**Dump Relocation**	**29 days?**
39	**Install septa conduit**	**29 days?**
43	**Upstairs Power Supply Work**	**5 days?**
47	**Tunnel Work**	**17.5 days?**
60	**Install Kicker Magnet System**	**17 days?**
65	Install Beam Stop	2 days
66	Pump down and leak check	1 day?
67	Pull Cables	4 days?
68	Terminate Cables & Connect	6 days
69	Alignment	2 days
70	**AC Pulsed Power Replacement**	**21 days?**
71	**West Booster**	**16 days?**
90	**East Booster**	**21 days?**



~9 weeks total, driven by
400 MeV line work